



## TO A HIGHER STANDARD

### Building Codes, Improved Efficiency and Air Quality in Utah



Poor air quality is both a health issue and an economic challenge in Utah, particularly along the Wasatch Front. One key driver of poor air quality is area source emissions, such as those from residences and commercial structures. Some argue that upgrading the Utah building code would yield substantial reductions in various types of harmful emissions, while others suggest that higher standards drive up housing costs at a time when rising prices are already posing socio-economic challenges.

**Finding 1: Driven by Utah's rapid population growth, over 12% of Utah's homes have been built since 2010 – a far greater proportion than the U.S. average. With a robust pace in new residential and commercial construction expected to continue, there is a unique opportunity to build in a manner that reduces each structure's pollution emissions. The payoff is long-term, with many of these buildings maintaining reduced emissions far into the future.**

Older buildings tend to be less efficient than newer ones, particularly older structures that have seen little upgrade over time. Some argue that Utah ought to focus on those older buildings. In fact, there are federal, state, utility-run, and other programs designed to clean up existing buildings. (See the sidebars on pages 11 and 25 of the full report.) This includes funding to add insulation to attics, upgrade furnaces to higher efficiency models, replace windows, and install solar panels and battery storage units. These programs and householder-financed remodels have made major improvements to existing stock, making homes much more efficient than when they were first built.

But there is a cost premium to retrofitting structures with better insulation, tighter envelopes and improved ductwork. Although the increased cost to install high-efficiency systems in new construction often makes financial sense, retrofitting might be cost-prohibitive.

**Finding 2: Heating air and water for residences and commercial buildings accounts for around 6% of winter inversion emissions for most Utahns; during other seasons and for Utahns living off the Wasatch Front, these emissions are a smaller proportion of local air pollution.**

The percentages for natural gas combustion seemingly represent a small portion of the Wasatch Front pollution problem. However, addressing air quality requires that Utah address multiple individual contributing sources with separate solutions in order to make a meaningful combined impact. When it comes to the fuel combustion slice of the pie, building code upgrades offer policymakers significant potential leverage.

**Finding 3: Given the regional variations in air quality issues related to area source emissions, Utah might explore whether relevant variations in building codes are appropriate.**

Much of the state outside the Wasatch Front has less to worry about in terms of air pollution. (There are exceptions: the winter ozone in the Uintah Basin, wintertime inversion pollution in Cache County and to a lesser extent other Utah valleys, and the summer ozone leaving the Wasatch Front for neighboring counties to the east.) Furthermore, there are significant differences in heating requirements in different areas of the state because average winter temperatures vary. Compare St. George, for example, to Salt Lake City. As a result, the state is broken into different climate zones based on different needs. Similarly, building code provisions that may be important to Wasatch Front air quality do not necessarily apply with the same urgency to other parts of the state. This is a key consideration for policymakers. Does Utah’s one-size-fits-all approach make sense?

Utah construction costs would increase under one percent under the 2021 code, with an out-of-pocket cost of under \$500. Utah homebuyers would recoup their out-of-pocket cost in two to three years from annual cash flow savings under the 2021 code, with a sharp decrease in the home’s local emissions.

**Building Code Energy Efficiency Concepts.** Building codes are complex. The same is true for the energy efficiency portion of those codes. There are at least four important concepts to understand within to fully grasp how these codes are related to air quality; it is important to understand Utah’s climate zones and the three general areas regarding efficiency, which are air tightness of construction, insulation and holding heat, and equipment. (See descriptions of each concept in the full report.)

The Utah Foundation undertook this study to “fine tune” the newest model energy efficiency standards. Through the course of this research, the Utah Foundation pivoted away from the fine-tuning approach for the following reasons:

1. While some of the building code’s energy efficiency approaches that would benefit air quality are estimated as being more cost-effective than others, they are determined by the model code authors to be cost-effective as a “package” – to be taken together as interdependent.
2. As numerous studies show, the newest model provisions are cost-effective across Utah, depending upon the efficiency options provided to builders.
3. Given the limited number of options that Utah has to improve air quality, it might make sense for the Utah Legislature to embrace the newest commercial and residential energy efficiency standards whole-heartedly in order to maximize the impact of code changes. Utah’s current residential code is an estimated 29% less energy efficient than the newest model code.

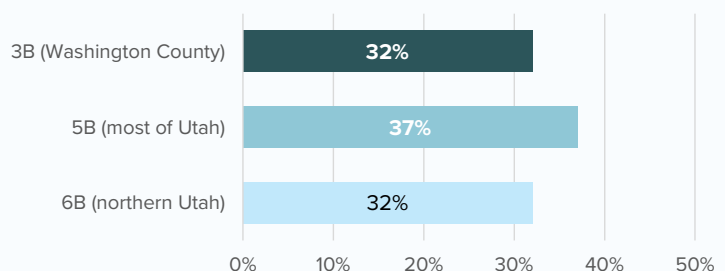
**Finding 4: The 2021 energy efficiency building standards are set for review by the Utah Legislature for adoption, rejection or amendment during the 2023 General Session.**

Utah’s Uniform Building Code Commission consists of 13 subject-matter experts and stakeholders approved by the Utah governor. The Commission’s committees review building code specifics and other building matters to advise the full Commission. The committees and Commission take a deep dive into building codes so that these particulars do not fall on the shoulders of the Utah Legislature.

The Commission’s meetings and public feedback aim to determine what it will recommend to the Utah Legislature. The Commission prepares a report and presents it to the Utah Legislature’s Business and Labor Interim Subcommittee with its recommendations for adoption. A bill from the Business and Labor Interim Subcommittee or a legislative sponsor is then vetted and voted on by both bodies in the subsequent legislative session. The next Subcommittee review will take place in late 2022 to be voted on during the 2023 General Session.

**Homeowners with homes built to 2021 standards could expect a one-third decrease in natural gas usage and commensurate local emissions reductions.**

**Percent Decrease in Natural Gas Usage – and Local Emissions Reduction (Compared to the 2015 IECC)**



Note: For homes with natural gas usage for heating and water heating, only.

Source: PNNL. Utah Foundation calculations.

**Finding 5:** The main arguments for updating the energy efficiency standards in the building code include: lower utility costs for residents, better air quality, and an increase in Utah employment. The main points of opposition include: new homes are only a small part of the problem, home costs are too high already, and the government is getting too specific in its building mandates.

Increasing a building’s energy efficiency often comes with a higher upfront construction cost (though not always; see the PNNL Commercial Study subsection on page 15 of the full report). The upfront cost is typically the key issue of debate when discussing building code updates since homes built to the newest building codes are inherently more expensive than their less-efficient counterparts. However, the cost savings on these efficiency improvements help pay the initial cost over time. This cost effectiveness comes from a decrease in monthly utility payments.

There are several ways of looking at costs: simple payback period, consumer cash flow, and life-cycle cost. (See descriptions of each in the full report.) When building codes are produced, they include efficiency items packaged together (like insulation and fenestration) that may not be cost-effective for each individual item but are cost-effective as a package (using life-cycle cost analysis). In addition to this cost-effectiveness, there are other societal benefits that many stakeholders consider, such as lower emissions and higher local employment.

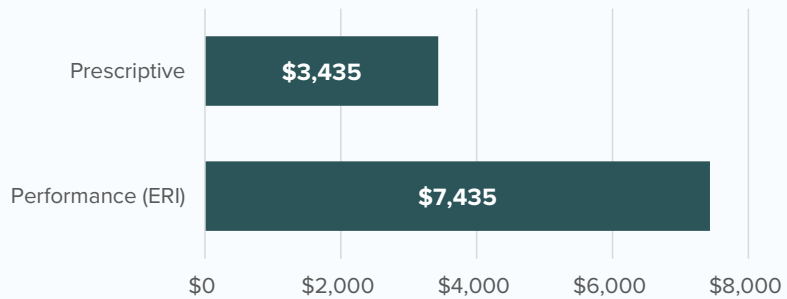
**Finding 6:** A study of updating the Utah commercial code suggests a substantial savings in energy costs and commensurate emissions reduction. Further, most buildings would experience a decrease in per-square-foot initial construction costs due primarily to the need for smaller heating and air conditioning systems.

A study of Utah commercial buildings shows clear improvement in efficiency – and commensurate air quality – as well as cost savings, both in initial construction savings and utility savings. While the initial construction result seems counterintuitive, the envelope efficiency costs are lower than the savings gained from a decrease in HVAC costs.

**Finding 7:** Studies of updating Utah residential code show life-cycle cost savings that appear to justify a full implementation of the 2021 energy efficiency standard.

**Utah homeowners could see a life-cycle cost savings of up to \$7,500 under the 2021 building code.**

**Life-Cycle Cost Savings of Shift from IECC 2015 to IECC 2021**



Source: Nexant.

Residential changes show mixed results across the four studies included in the full report. Three show substantial cost savings, while one does not. However, the outlier seems to have methodological errors. (See the sidebar on page 19 of the full report.)

All the studies show the air quality benefit of 2021 IECC adoption – either directly or implicitly – through the decreased use of natural gas from energy-efficiency improvements.

None of the studies’ analyses are based on Utah’s commonly used REScheck compliance method. As such, all understate the energy-efficiency improvements and commensurate air quality improvements that would occur in Utah under a full implementation of the 2021 IECC standards.

**The Latest Recommended Code.** The main energy efficiency code for discussion by the Uniform Building Code Commission and the Utah Legislature is the IECC 2021. The IECC 2021 seeks to “regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.” There are six major differences between Utah’s current code – the residential 2015 IECC, as amended – and the 2021 IECC. (See details of each in the full report.)

It is important to note that most of these updates to the 2021 IECC – even if adopted by the Utah Legislature – would not be applicable to much of the new construction in Utah. The 2021 IECC has many energy efficiency improvements over what is required under Utah’s REScheck compliance path. (See Finding 9 and the sidebar on page 7 of the full report.) But given the Utah code allowance for using REScheck – which may remain in Utah code – many builders in the state would likely continue using REScheck as their preferred code compliance method. This would result in newly constructed homes that are not built to the energy efficiency standards laid out in the 2021 IECC.

**Finding 8:** The cost of implementing the 2021 energy efficiency standards would be between 0.4% and 0.7% of a new \$600,000 home (under \$5,000). In terms of household cash flow, initial costs would be recouped within two or three years. These homes would see a one-third annual reduction in local emissions – and a larger reduction during winter months.

These changes would result in an out-of-pocket increase for a new homebuyer of between \$287 and \$474 (amortized over a 30-year mortgage; see other particulars in the notes to Figure 18 in the full report.) These same homebuyers would see an annual cash flow savings of between \$109 and \$252. (See Figure 19 in the full report.)

**Costs and benefits are a moving target.** Building construction costs have been increasing in recent years. Furthermore, mortgage interest rates have doubled since 2021. On the other hand, energy prices are skyrocketing. To the degree that costs increase from building construction costs, mortgage interest and otherwise, the annual cash flow savings decreases. To the degree that energy costs increase, the annual cash flow savings increase.

**Finding 9:** There is a standing energy efficiency loophole in Utah’s building codes that is used with such frequency that it undermines any code update. It also creates transparency issues.

The Utah Uniform Building Code Commission’s Mechanical Advisory Committee reviewed proposed amendments to the model IECC code through June of 2022. The Committee suggested numerous amendments to the Commission. Perhaps most importantly, the Committee included the REScheck allowance used in current Utah code. In discussing this, they noted that the mechanical systems trade-off using the Utah 2012 REScheck creates a loophole that allows the installation of a poorly insulated and less efficient building envelope. This was due not to the Committee’s own preferences but to a political expectation that the Utah Legislature would want to keep the current loophole.

However, the Committee suggested (and Utah Uniform Building Code Commission agreed) that if the Utah Legislature wants to retain this loophole in Utah code, it should be amended from a 5% efficiency improvement beyond the 2012 REScheck.

**The REScheck “loophole” creates transparency issues. While, on the surface, Utah can claim credit for bringing its code up to the latest standard, in reality the loophole is used with such frequency as to undermine any code update.**

**Finding 10:** Since the 2000s, the independence of Utah’s Uniform Building Code Commission has diminished. Observers say that energy efficiency code adoption that affects air quality has become a much more political process.

The energy efficiency building code adoption process in Utah is not free of political considerations. The Uniform Building Code Commission used to decide on whether Utah would follow the model code. In 2011, the Legislature changed it into an advisory body that sends the model code with recommendations to the Legislature for consideration. With that as the arrangement, the Commission’s job should be to send the Legislature its best recommendations on what form the new code should take and let the Legislature make its own amendments, with accountability to voters. However, while the Mechanical Advisory Committee and the full Commission did consider each of the code particulars, they also included the REScheck “loophole” out of deference to the presumed expectations of the Legislature. (See the sidebar on page 7 of the full report.) This seems to short-circuit the decision-making process by moving a political decision into the advisory phase.

Similar questions recently arose within the Commission structure. The Mechanical Advisory Committee is a responsive body that discusses code amendments provided by advocacy and lobbying groups for the purpose of advising the full Commission. However, in June 2022, a lobbying group went directly to the full Commission seeking amendments to portions of the IECC model code before the Mechanical Advisory Committee presented its recommendations. The Utah Foundation has been told that this is not standard procedure, raising questions about the influence of special interests.

**Conclusion.** When it comes to air quality, building codes offer policymakers real leverage in making a direct, meaningful impact far into the future. As the 2021 energy efficiency standard approaches adoption, a careful consideration of the costs and benefits both financially and for public health is well-warranted.

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